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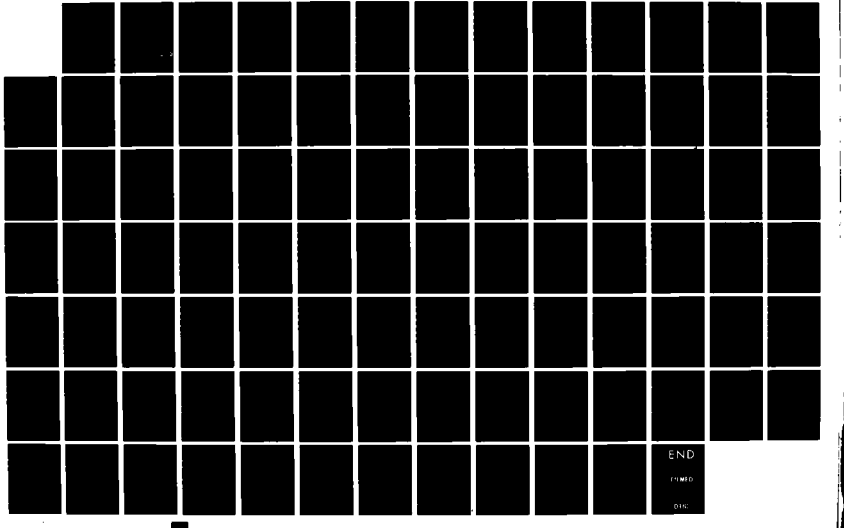

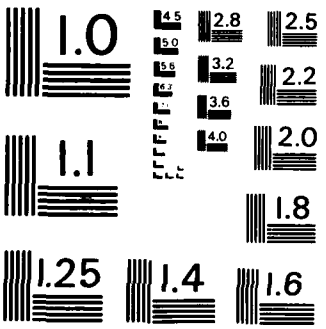

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INITIAL AND QUALIFICATION OPERATIONAL TEST AND EVALUATION IN THE ACQUISITION OF NON-MAJOR COMMUNICATION SYSTEMS

THESIS

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AFIT/GLM/LSM/85S-69

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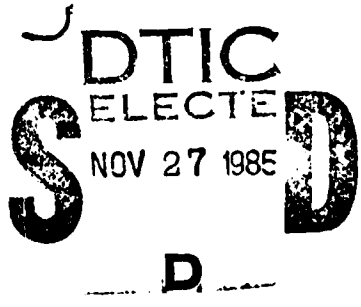

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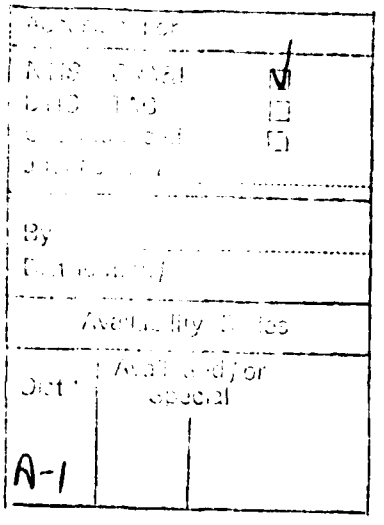

AFIT/GLM/LSM/85S-69

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THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

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Captain, USAF

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Preface

The purpose of this study was to determine the extent to which AFCC Operational Test and Evaluation reports were used to aid in the program decision-making process for communication systems. Much of the research that has been accomplished on Operational Test and Evaluation has primarily focused on its effect on major programs. The focus of this research has been on non-major programs at the major command (MAJCOM) level.

Review of the available literature and regulatory guidance combined with interviews of program managers and test directors revealed that operational testing is very different for minor programs. Quite often the purpose is more to identify deficiencies than to have a significant input into the program decision-making process. However, this is not to say that this practice is wrong. Many of the minor programs use commercial off-the-shelf equipment modified for military use or equipment already in the military inventory but reconfigured to satisfy changing requirements. For these types of systems the greatest value of operational testing is to identify problems with interoperability since many of the individual equipment items have already been extensively tested separately.

There is a definite need for operational testing at every level from the major program to the non-major program. Without it the Air Force would not be assured of procuring the best systems possible. It is hoped that this paper will serve to enhance the understanding of how operational test and evaluation is conducted for non-major programs at the MAJCOM level and specifically within Air Force Communications Command.

In conducting this research I have become indebted to a great number of people. I wish to thank my thesis advisor, James D. Meadows, and Lt. Col. John Dumond for their patience and guidance in this effort. I would also like to acknowledge the invaluable assistance of the members of the 1815th Test and Evaluation Squadron. They are true professionals and I have thoroughly enjoyed working with them throughout this research effort. Special thanks is also owed to Phyllis Reynolds for the care with which she typed these pages. Finally, I would like to thank my family and friends that continually supported me with their prayers and encouragement.

— Lorraine Y. Roemish

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Abstract

The use of operational test and evaluation (OT&E) results in the acquisition decision-making process has been increasingly emphasized in the past years and has gained even more prominence with the establishment of the Operational Test and Evaluation Office at the Department of Defense. Special emphasis has been placed on the use of OT&E in the production decision. Initial Operational Test and Evaluation (IOT&E) and Qualification Operational Test and Evaluation (QOT&E) are the types of test and evaluation that are normally conducted on systems prior to the first major production decision in the acquisition process. While IOT&E usually evaluates new systems and QOT&E usually evaluates off-the-shelf systems, they both provide program decision makers with valid estimates of operational effectiveness and operational suitability upon which they can base their decisions. This research has looked at how IOT&E and QOT&E reports written by the 1815th Test and Evaluation Squadron (AFCC) are used in the acquisition of non-major communication systems. The results of this research reveal that the OT&E conducted by the 1815th is usually QOT&E performed on off-the-shelf systems. Since these systems involve very little technical risk the OT&E

results are not usually the primary factor in production decisions. OT&E results are most useful in pointing out deficiencies requiring correction prior to fielding such systems.

INITIAL AND QUALIFICATION OPERATIONAL TEST AND EVALUATION IN THE ACQUISITION OF NON-MAJOR COMMUNICATION SYSTEMS

I. Introduction

Initial Operational Test and Evaluation (IOT&E) is an important phase of test and evaluation performed during the Air Force acquisition process. IOT&E is conducted prior to the first major production decision to provide program decision makers with valid estimates of the operational effectiveness and operational suitability of a system. It is the type of test and evaluation of foremost concern to the major command that will eventually have the responsibility for operating and supporting a new system. IOT&E is usually the first opportunity that the using command has to evaluate how well the system fulfills the operational need it was designed to satisfy. The results of the IOT&E effort can have a significant impact on the acquisition and life cycle costs for a system, especially if major deficiencies are found that require modification to the system design. Since it is usually much easier and much less expensive to correct a problem the earlier it is detected, the efficient and effective performance of IOT&E

is of concern to the Air Force and to each major command involved in the acquisition of new systems.

Background

The primary objective of this research effort is to determine the extent to which IOT&E conducted by the Air Force Communications Command (AFCC) is used in making production decisions in the acquisition of communication systems. An in-house study initiated in 1983 by AFCC of the overall management of operational test and evaluation (OT&E) indicated that there were several areas that required improvement in regard to the conduct of OT&E (16). The use of test reports in the acquisition decision-making process was one such area.

The study was initiated to answer questions and resolve problems perceived to be present in the way that test and evaluation was performed by AFCC. Originally intended to be conducted by an independent research firm in July 1983, the study was instead tasked to the 1815th Test and Evaluation Squadron (TES) in August 1983 after funding for the project was disapproved (17). It is important to note that the 1815th TES is the primary organization within AFCC responsible for the conduct of OT&E. While the results of the study cannot be considered totally without bias, the findings indicated an earnest effort on the part of the study team to provide a report as impartial as possible.

The team assigned to undertake this evaluation task was given only five weeks to complete the study. Because of the extent of the tasking, this was not an adequate length of time in which to do a complete and thorough job. Even so, many of their findings appear valid and warrant further investigation. Major problems that the team identified included several deficiencies in current regulations applicable to operational test and evaluation, inconsistencies in the approval policy for test reports, inadequate follow-up on test recommendations, and a lack of training for OT&E personnel (16). The specific findings that generated this current research effort were the result of interviews performed by the research team of the various offices tasked with either generating or reviewing the test reports. A common complaint seemed to be that, in many cases, the OT&E results and recommendations did not appear to have been a significant factor in the production decisions. The implication is that potential cost savings may not be realized if the recommendations are ignored when making the production decision. Determining the source for this perception, whether or not it is valid, and some possible solutions comprise the central thrust of this research.

Definitions

Operational test and evaluation (OT&E) is one of two general kinds of test and evaluation of importance in the system acquisition process. The other is development test and evaluation (DT&E). Both of these are operationally defined in Air Force Regulation (AFR) 80-14 and Air Force Regulation (AFR) 55-43. In accordance with these documents, DT&E is concerned with demonstrating that the system engineering design and development is complete, that design risks have been minimized, and that the system will perform as required and specified (10:1; 11:2). DT&E is primarily the responsibility of the implementing command (usually Air Force Systems Command or Air Force Logistics Command) and the contractor providing the system.

OT&E, on the other hand, is concerned with system performance under conditions as realistic as possible in order to estimate a system's operational effectiveness and operational suitability, to identify any operational deficiencies, and to identify the need for any modifications (11:2). In order to understand what is meant by operational effectiveness and operational suitability, DODD 5000.1 offers the following definitions:

> 1. Operational Effectiveness. The overall degree of mission accomplishment of a system used by representative personnel in the context of the organization, doctrine, tactics, threat (including countermeasures and nuclear threats) and environment in the planned operational employment of the system.

2. Operational Suitability. The degree to which a system can be placed satisfactorily in field use, with consideration being given to availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistic supportability, and training requirements. (3:3)

These definitions show the wide variety of issues that OT&E is concerned with. In essence, operational effectiveness is how well a system performs its intended mission in its intended environment, while operational suitability is how well the system is suited for operation and maintenance by military personnel in the field (1:A-3). Depending on the size of the program, OT&E is managed and conducted by either the Air Force Operational Test and Evaluation Center (AFOTEC) or the command which will use and maintain the system when it is deployed.

Both OT&E and DT&E are essential and complementary elements of the systems acquisition process and occur throughout the system's life cycle. However, it is during OT&E that the users can have the greatest impact on the final configuration of the system they will eventually be tasked to operate.

There are three types of OT&E: initial OT&E (IOT&E), follow-on OT&E (FOT&E), and qualification OT&E (QOT&E). IOT&E is conducted before the first major production decision using a prototype or a preproduction article. FOT&E is operational testing usually conducted after the first major production decision or after the first

production article has been accepted. QOT&E is performed instead of IOT&E on programs where there is no funding for research, development, test and evaluation (RDT&E) (11: 2-3). As mentioned earlier, this research effort is primarily concerned with IOT&E. However, since QOT&E is performed before the first major production decision and essentially performs the same type of testing, but on commercial off-the-shelf equipment, it will also be reviewed in this paper.

Research Questions

The major research question for this thesis concerns the usefulness of IOT&E results obtained by AFCC to the system acquisition process. In essence, does IOT&E serve the purpose intended according to current regulations? The questions chosen to pursue this line of thought follow.

1. Are the evaluation reports sufficient in terms of practical recommendations to provide valid input into production decisions? If not, is this caused by:

a. Insufficiently trained test personnel,

b. Lack of inadequate manpower,

c. Insufficient guidelines or regulations that should be providing more in-depth information on testing procedures,

d. Report being accomplished/prepared too late in the acquisition process,

e. Inadequate time,

f. A combination of the above,

g. Other factors.

2. If the test reports are deemed sufficient, are they being used effectively by program decision makers?

a. What is the perceived value of the test reports to the overall program manager (PM)?

b. Are the test results being considered by the PM when making production decisions or in formulating recommendations on production decisions that are to be made by higher level decision makers? In what way?

c. If not used in the production decision, why not? What criteria are used in making production decisions?

d. What are some recommendations for improving the usefulness of IOT&E test results to the acquisition decision-making process?

These are the questions that this research effort will attempt to answer. The next chapter will discuss the evolution of OT&E and describe how the test and evaluation process enters into the system acquisition process in the Air Force and is an integral part of it. This discussion will provide the reader with a better understanding of the focus of this paper.

II. Literature Review

The previous chapter introduced the primary focus of this research, namely the determination of the usefulness of AFCC initial operational test and evaluation (IOT&E) results in making production decisions. As mentioned earlier, IOT&E is an important phase of test and evaluation performed during the Air Force system acquisition process. To understand this concept more fully it is first necessary to have a feel for how the overall Air Force system acquisition process functions. Before discussing the system acquisition process and how the different types of test and evaluation fit into it, this chapter will review the evolution of operational test and evaluation in order to show how it has grown in importance in recent years. This discussion will then lead into the current system acquisition process, the regulatory guidance for test and evaluation and, finally, a brief description of the history and mission of the 1815th Test and Evaluation Squadron.

The Evolution of Operational Test and Evaluation

The beginning of operational test and evaluation of aircraft and air weapon systems associated with them

can be traced to the purchase of the first airplane from the Wright brothers in 1909. After the Wright brothers had successfully demonstrated the ability of their airplane to satisfy the contract specifications, the airplane was shipped to Fort Sam Houston, Texas where Captain Benjamin Foulois was tasked to evaluate it and "teach himself how to fly." It was not long before he discovered operational deficiencies. In the course of his evaluation, Captain Foulois found that having no seat on the airplane was a distinct disadvantage during hard landings as he was frequently being thrown to the ground. To correct this problem he bolted a metal tractor seat to the frame and while this helped some, he still fell off on occasion. He eventually found that by looping his Sam Browne belt through the seat he could secure himself to the airplane and solve the problem (8:2-1). This process of assessing the capabilities of a system, uncovering its deficiencies and correcting them is still a part of OT&E today.

Although the need for operational testing was recognized early on, it was not until 1948 that a systematic approach to operational testing of Air Force weapon systems was instituted. During this time frame the Air Proving Ground Command (APGC) was established to conduct operational test and evaluation on Air Force systems. From 1948 until 1957 the APGC served as the Air Force's

independent testing agency, reporting test results directly to the Chief of Staff of the Air Force (8:2-1).

> With growth, and because of its high visibility, the Air Proving Ground Command became vulnerable. Its size made it cumbersome and slow to respond to developers, to the operating commands, and to the Chief of Staff in his decision making capacity. New weapon systems were often developed, produced, and operationally deployed before the Air Proving Ground Command completed its suitability testing. In fact, it was never intended that the work of the APGC be used to support the production decision making process. Rather, its mission was to test new production weapon systems, to accurately chart their capabilities, and prescribe the procedures for their most effective use and support. (25:5)

As a result of criticisms leveled at it, the APGC was reorganized and combined in 1957 with the Air Force Armament Center and made subordinate to the Air Force Systems Command (then called the Air Research and Development Command). The resulting Air Force Armament Development and Test Center was not capable of performing effective, independent operational testing. The primary emphasis shifted to developmental test and evaluation (8:2-1).

Operational test and evaluation then became the responsibility of the operating commands who were left to develop their own policy and guidance on OT&E since the central office within Air Staff established in 1948 for this purpose was abolished when APGC was discontinued. This situation caused a funding problem since there was no provision for separate OT&E funds within the command.

The funds for OT&E were considered part of operations and maintenance funding and quickly became the area most vulnerable to cuts when funding was limited. OT&E efforts were reduced significantly because of this funding problem (25:5-6).

It soon became apparent that this arrangement was not satisfactory either. Several studies advocating the restoration of a central focal point at Air Staff finally prompted the Air Force Chief of Staff in 1964 to direct the establishment of an office within the Air Staff to provide centralized guidance and direction to the fragmented OT&E effort. This office was eventually titled the Deputy Director of Operations for OT&E and was responsible for the Air Force OT&E Program until 1974 (8:2-2).

Although a focal point for OT&E was once again established at the Air Staff level, there was no significant change in the way OT&E was conducted. While intended to support the acquisition process, operational test results frequently came too late to affect production decisions. OT&E was routinely being conducted on new weapon systems after production had already begun (8:202).

> By 1970 it seemed clear that system failures, the high cost of procurement, and the extensive post-production modification of systems procured in the 1960s could be particularly attributed to inadequate and, in some cases, the complete lack of operational test and evaluation prior to production. The necessity for operational test and evaluation as early as possible in the acquisition cycle became obvious. (25:9)

The Blue Ribbon Defense Panel, convened by President Nixon to study the systems acquisition process within the Department of Defense, found that the conduct of OT&E by the services was generally inconsistent and ineffective. Some of the major findings noted in Appendix F to the Panel's 1 July 1970 report include the following:

> OT&E can and should contribute significantly to decision making at all levels of DOD. However, unless the process of acquiring military materiel is radically altered, it is improbable that OT&E can be done in time to provide "go/no-go" recommendations on whether to commence production of operationally configured major systems.
>
> The results of OT&E which has been accomplished have not been adequately made available to or used by DOD agencies which need them. There is no method of evaluating and preserving such information.
>
> Existing ranges and other facilities have been marginally adequate to support the OT&E which has been performed. There is well founded doubt concerning their adequacy for OT&E which should have been but was not performed. There is serious concern as to whether future requirements for such ranges and other facilities can or will be met.
>
> OT&E within the Services is done most effectively when OT&E organizations report directly to the Chief of the Service, representing both the developer and the user, but organizationally independent of both. There are, however, considerable forces within the services which resist the independence of OT&E organizations.
>
> . . . . . .
>
> There is a shortage of experienced and capable personnel directly involved with OT&E. There has been inadequate use of civilian scientists and operations researchers/systems analysts in OT&E at all levels, but particularly where operational testing is actually being planned, conducted and analyzed.
>
> Conduct of needed OT&E is being adversely affected by inadequate funding and particularly by the lack of budget identity for OT&E funds. (25:10-12)

An initial DOD response to these recommendations was the establishment of an office to oversee OT&E at the DOD level. Deputy Secretary of Defense Packard established the office of the Deputy Director for Test and Evaluation (DDT&E) within the office of the Director of Defense Research and Engineering (DDR&E) for this purpose (8:2-3). In addition, the DOD published DOD Directive 5000.1, dated 31 July 1971, on the acquisition of major defense systems. This directive outlined the major decision points in the DOD acquisition process and established the Defense Systems Acquisition Review Council (DSARC). The DSARC had the responsibility for reviewing major programs at each of the three major decision points in the acquisition process and making recommendations to the Secretary of Defense on required actions. DOD Directive 5000.1 did not address direct user involvement prior to the second major decision point (Full-Scale Development), and it did not require an independent operational test agency. It did, however, stress the importance of an operational assessment prior to production decisions (2:6).

Formal DOD policy on OT&E was finally provided on 19 January 1973 through DOD Directive 5000.3, Test and Evaluation. In this directive OT&E was extensively defined and much of the existing policy on OT&E confirmed. The most significant provision in the directive required that "one major field agency (or a limited number of such

major field agencies) separate and distinct from the developing/procuring command" be established. In compliance with this direction, the Air Force established the Air Force Test and Evaluation Center (AFTEC) as a separate operating agency on 1 January 1974 (2:6-7).

The charter regulation for AFTEC, AF Regulation 23-36, particularly addressed many of the criticisms made by the Blue Ribbon Defense Panel. AFTEC was tasked with providing the results of evaluations on major systems to the Secretary of the Air Force and the Chief of Staff for consideration in DSARC reviews at key decision points. It established AFTEC as a separate operating agency independent from the developer and the user. Test teams were to be comprised of specialists from the using and supporting commands with skills similar to those expected by operators and maintainers of the employed system. In addition, it provided for the establishment and maintenance of a data bank to preserve relevant information on test and evaluation results, to project testing requirements and resources, and to track testing milestones (7; 25:26-27).

Test and Evaluation policy did not significantly change for several years.

> DODD 5000.1 went unchanged for nearly 4½ years, while 5000.3 experienced only minor changes. The latter deleted the option of having more than one independent agency and further stipulated that the one remaining field agency would be independent of the using command as well as the developing command. (2:8)

Major changes in these documents took place after the Office of Management and Budget (OMB) Circular A-109, titled Major System Acquisitions, was published on 5 April 1976. The purpose of the circular was to update DOD policy on acquisition management. Some of the significant changes included a greater emphasis on initial, critical phases of acquisition; the focusing of acquisition requirements on user established mission needs; insistence that service requirements be expressed in mission terms rather than known solutions; and the introduction of a new key decision point, Milestone 0, Program Initiation (8:6-1). The Milestone 0 decision point required the review and validation by DOD decision makers of the operational need prior to the start of a program. The updated version of DOD Directive 5000.1, published in 1977, incorporated this new policy guidance. The directive described the role of the program manager in great detail and deleted the requirement for presenting operational test results to the DSARC in support of production decisions. The review level for major programs reverted to the Service SARC (AFSARC) chaired by the Service Secretary or Assistant Secretary. Test results were only reported to the DSARC if deemed necessary by the Service Secretary (2:9).

The revision of DODD 5000.3 contained major policy changes with regard to test and evaluation. Test objectives and evaluation criteria had to be established prior

to the start of testing. IOT&E was to begin as early as the Conceptual Exploration phase following Milestone 0 in order to assess the operational impact of the alternative technical approaches. In addition, the directive required test agencies such as AFTEC to monitor DT&E to insure that the system was ready for operational testing. The timely preparation of the Test and Evaluation Master Plan (TEMP) was emphasized. It had to be completed shortly after Milestone I during the Demonstration and Validation phase rather than during the Full-Scale Development phase prior to Milestone III (2:13). All of these changes served to bring OT&E into the acquisition process earlier and linked it closely to the decision-making process.

The sentiments expressed in the following quote are just as true today as they were over ten years ago when this was written.

> The test and evaluation evolution we are witnessing today is not unlike the wave of consumerism which has been sweeping our country for the past several years. The motivations are the same--Congress, representing the people of our country is tired of buying systems which cost too much and won't perform as advertised. Therefore, in addition to continuing emphasis on program cost and schedule considerations, test and evaluation must take on new importance. (1:30)

Test and evaluation is taking on new importance even today. In fact, just this April Mr. John E. Krings was appointed as the first director of the Defense Department's new Operational Test and Evaluation Office (19:18). This

office was established by congressional direction for the purpose of overseeing OT&E conducted by the Services on major weapon systems. It is significant to note that this appointment generally lags the initial ratification of the position.

> The position was established by amendment to Title 10 of the United States Code in the Department of Defense Authorization Act of Fiscal Year 1984 (Public Law 98-94), dated September 24, 1983. The legislative amendment to establish the position was passed 91 to five in the Senate and by voice vote in the House of Representatives implying broad consensus and no significant opposition. The legislation was passed in spite of opposition from the Department of Defense. (14:7)

The motivation for creating this new office can be traced back to the findings of the Blue Ribbon Defense Panel; the central issue being the independence of the OT&E agencies from the developer and the user. The previous office responsible for OT&E at the DOD level was located within the office of the Under Secretary of Defense for Research and Engineering. Having the OT&E office within the office responsible for development and procurement of weapon systems unavoidably created conflict of interest. An explanation of the reluctance to establish an independent OT&E office at DOD can be described in terms of this conflict.

> Operational testing, especially "independent" operational test and evaluation lacks a natural constituency in the Department of Defense and military services as development agencies and using commands are interested in fielding weapon systems as soon as possible, while operational test and evaluation agencies identify deficiencies that impede the procurement schedule. (14:15)

The charter for the Director Operational Test and Evaluation, Department of Defense Directive 5141.2, was signed by Deputy Secretary of Defense Taft on 2 April 1984 (14:32). It requires the Director OT&E to be a permanent member of the Defense Review Board and the Defense Systems Acquisition Review Council. He is also required to submit reports of operational tests of major weapon system programs to the Armed Services and Appropriations Committees on the Senate and House of Representatives (14:33). These provisions will ensure that operational testing receives greater consideration in making acquisition decisions within the DOD. In fact, the Director of OT&E must approve the adequacy of test plans for major acquisition programs prior to implementing them and submit a report to the Secretary of Defense and Congress prior to a final decision within DOD to proceed with a major weapon system beyond low-rate initial production (14:36-37).

The Director and his staff are independent of the office of the Under Secretary of Defense for Research and Engineering and report directly to the Secretary of Defense. Their independence is further assured by the provision for a separate funding statement in the Presidential budget (14:36). This independence is in consonance with the recommendation originally made by the Blue Ribbon Defense Panel to have OT&E agencies independent from the developer and user. The impact this new office will have on the

acquisition decision-making process is still a matter of speculation. The Director of Operational Test and Evaluation has the potential for being very influential in the acquisition process. How influential will depend on the Secretary of Defense.

Test and Evaluation in the System Acquisition Process

The Air Force system acquisition process is the sequence of activities that are followed by the Air Force in order to acquire a new system designed to satisfy valid mission needs. The structure of the current system acquisition process is based on the Office of Management and Budget Circular No. A-109 that established the policies to be followed by executive branch agencies in the acquisition of major systems. Department of Defense Directive (DODD) 5000.1, Major System Acquisitions, and Department of Defense Instruction (DODI) 5000.2, Major System Acquisition Procedures, were updated to incorporate the policy guidance of OMB Circular No. A-109. Together these three documents guide the system acquisition process for the Air Force as well as other military services and DOD agencies.

The current system acquisition process consists of four major phases and four associated key decision points or milestones. While most major programs progress through these four phases, the intent of Circular No. A-109 was not to establish an inflexible set of sequenced activities, but

rather to provide sufficient guidance to allow the tailoring of an acquisition strategy to each individual program (26). With this in mind, the following discussion will describe the four phases and four milestone points that are typically encountered in the major system acquisition process. Since this paper is primarily concerned with the Air Force acquisition process, the discussion will focus on the Air Force implementation of the DOD guidance provided for acquiring major systems.

Milestone 0/Concept Exploration. The first milestone point is sometimes referred to as Milestone 0 or the Mission Need Determination/Program Initiation decision point. It is at this point that an operational need is identified and validated based on an assessment of the threat. Operational needs are initially identified at the major command level and submitted to Headquarters Air Force (HQ USAF) for validation after they have been reviewed by Air Force Systems Command (AFSC), Air Force Logistics Command (AFLC), and Air Training Command (ATC), and other commands as necessary. These reviewing commands "assess the technology and constraints to satisfy the need, identify known solution candidates, and estimate necessary resources for need satisfaction" (18:5). Validation of the stated need initiates the acquisition process and begins the Concept Exploration phase. HQ USAF provides formal

guidance to the implementing and participating commands by means of a document called the Program Management Directive (PMD) which will be continually updated throughout the system acquisition life cycle to reflect changes in the program.

Before proceeding to the Concept Exploration phase, the operational need is categorized based on the type of system required to satisfy it. There are essentially three types of program categories: DOD Major Programs, Air Force Designated Acquisition Programs, and Air Force Non-Major Programs. The program designation determines the appropriate review authority and the nature of the documentation that is required. The first of these, DOD Major Programs, are so designated when the program has Secretary of Defense interest; involves a joint acquisition of a system by the DOD and representatives of another nation, or by two or more DOD components; the estimated costs exceed $200 million (FY80 dollars) in Research Development Test and Evaluation (RDT&E) funds or $1 billion (FY80 dollars) in procurement/production funds, or both; and/or the program has significant congressional interest (3:6). Currently major programs require Secretary of Defense (SECDEF) review at Milestones I and II and will not enter the Concept Exploration phase until the major system has been included in the DOD budget (21:11). With the establishment of the Defense Department's new Operational Test and Evaluation Office

earlier this year there is some indication that Milestone III decisions will also require SECDEF approval in the future. The Defense Systems Acquisition Review Council (DSARC) is the advisory body that makes recommendations to the Secretary of Defense on all such decisions.

The Air Force Designated Acquisition Program (AFDAP) is the second program category. This type of program is less than a major program and requires Secretary of the Air Force (SAF) approval at Milestones I, II, and III, with the advice of the Air Force Systems Acquisition Review Council (AFSARC). This category of programs will usually have estimated costs (FY80 dollars) for research, development, test and evaluation between $100 and $200 million or $500 million and $1 billion for procurement/production (5:96).

The final program category is that of Air Force Non-Major Programs. Non-major programs are those which do not fall into one of the first two categories. The approval level required is as directed by HQ USAF and may vary depending on the program. The guidance provided by Air Force Regulation (AFR) 800-2, Acquisition Program Management, states that programs other than DOD Major and AFDAPs are to be managed according to the guidance in DODD 5000.1 and DODI 5000.2 to the maximum possible extent. For the most part the management of these programs is left to the implementing commands which are required to document

milestone decisions and submit an information copy of such documentation to HQ USAF. All of the programs studied in this paper will fall into this final category. Non-major programs have not received the close scrutiny that some of the major programs have because of the dollar amounts. However, the efficient management of these non-major programs is of concern also since there are potential areas to save money.

After the program category has been identified and the program has been approved at HQ USAF, it proceeds into the Concept Exploration phase. During this phase there is only a commitment to identify and explore alternative solutions that could possibly satisfy the operational need. These alternatives are usually in the form of paper studies; however, limited experiments and tests may be conducted "to determine the technical feasibility of concepts, defined subsystems, and key components" (21:16). The testing performed during this phase is primarily Development Test and Evaluation and is normally performed by the contractor submitting a proposal for consideration in meeting the operational need. Even so, DODD 5000.3 states that Operational Test and Evaluation "will be accomplished as appropriate, to assess the operational impact of candidate technical approaches and to assist in selecting preferred alternative system concepts" prior to the Milestone I

decision (4:3). This implies that OT&E could be introduced as early as the Concept Exploration phase.

The program manager (PM) is assigned during the Concept Exploration phase. This individual is the single manager for the program and is responsible for assembling a team to help in accomplishing the program objectives. At the end of the Concept Exploration phase the PM and his management team will have selected the concepts that were evaluated as most promising and which are felt to warrant system demonstration. For major programs the Secretary of the Air Force will request SECDEF approval at Milestone I, also known as the Requirement Validation decision point, for entry of the program into the Demonstration and Validation phase (21:17). Non-major programs require HQ USAF approval or approval as directed by HQ USAF, which may be at the MAJCOM level.

Milestone I/Demonstration and Validation. At the Requirement Validation decision point the documentation submitted for SECDEF review must contain the Test and Evaluation Master Plan (TEMP) as described in DODD 5000.3 (3:7). The TEMP is required to relate test objectives to required system characteristics and critical issues, and to integrate objectives, responsibilities, resources and schedules for all test and evaluation to be accomplished during the acquisition process (4:7). The intent of the

guiding regulations is clearly to introduce test and evaluation as early as possible into the system acquisition process. Insight into the reasoning behind this is provided by McCarty in the following narrative on the purpose for test and evaluation in the acquisition process.

> The primary purpose of test and evaluation (T&E) during the acquisition process is the reduction of risk, either the risk that the system or equipment will not meet performance specifications or the risk that the system or equipment cannot be effectively employed in its intended operational environment. Furthermore, T&E is the primary means by which achievement of program objectives is demonstrated to continuing or increasing the commitment of resources to acquisition programs. (21:27)

Introducing test and evaluation as early as possible into the acquisition process allows key decision makers to have a means by which they can judge the risks inherent in the program and a basis upon which to base their decisions.

For programs that have been approved at Milestone I, the next phase is the Demonstration and Validation phase. The objective during this phase if to validate the alternative solutions and determine the technical, cost, supportability, and schedule risks involved with each resulting in a selection of one of the competing systems for further refinement in the Full-Scale Development phase. The alternative solutions selected during concept exploration are more clearly defined and expanded in one of three ways: (1) primary system hardware prototyping, (2) "paper"

studies, or (3) paper definition plus subsystem prototyping (21:22).

The prototype systems designed during this phase are primarily concerned with validating the performance objectives rather than the operational objectives (23). Validating performance objectives is a major concern of DT&E and is normally performed by the contractor and selected personnel from the implementing command (usually AFSC). DT&E conducted at this juncture is designed to identify the preferred technical approach, including the identification of technical risks and feasible solutions (4:2). Although performance objectives are the primary concern during this phase, operational objectives need to be considered as well. According to DODD 5000.3 OT&E should be accomplished, as necessary, to examine the operational aspects of the selected alternative technical approaches and to estimate the potential operational effectiveness and suitability of the candidate systems. In addition, decisions made at this point "to commit funds for production long lead time items or limited production must be supported by OT&E results" (4:3-4). The intent is clearly to link the test and evaluation results to the decision-making process. The implication is that decisions made on the basis of objective test results will be better decisions. Few would argue with this statement.

Test results provide valuable information to program decision makers for use in determining whether the system is ready to proceed to the next phase of the acquisition process. When major test objectives have not been met, chances are that the system will require further refinement before it will be suitable. If test results indicate that the system is not able to meet the operational need for which it was designed, the best course of action may well be to reject that concept and choose another that is more capable of satisfying the stated requirement. Testing results can therefore be essential for making appropriate and informed decisions on the program.

Milestone II/Full-Scale Development. At the end of the Demonstration and Validation phase for major programs the Secretary of Defense will decide which of the possible alternatives will proceed into the Full-Scale Development phase. This decision point is known as Milestone II or the Program Go-Ahead decision point. Once an alternative has been chosen, it will be more thoroughly developed and tested during the Full-Scale Development phase. The end result of this phase will generally be a pre-production prototype and the technical documentation necessary to produce the system. In fact, "the items tested must be sufficiently representative of the expected

production items to ensure that a valid assessment can be made of the system to be produced" (4:4).

It is during the Full-Scale Development phase that OT&E is emphasized. At this point there is actually a functioning system that the operators can put their hands on. Operational testing performed on actual equipment yields much more useful and valid results than would be possible on purely conceptual models or through strictly DT&E testing alone. This fact is recognized by DODD 5000.3 which provides that the Initial Operational Test and Evaluation (IOT&E) of the system must be accomplished prior to the Milestone III decision on items sufficiently representative of the expected production items to provide a valid estimate of the system's operational effectiveness and suitability.

It is important to realize that both DT&E and OT&E testing are necessary to fully evaluate a new system. DT&E alone is not a suitable substitute for OT&E.

> DT&E can supply useful information to OT&E, but it cannot replace OT&E at any point in the life cycle of the system. If an attempt is made to dispense with OT&E, as often occurs when budget constraints must be contended with, unpleasant surprises are in store for the system operators when the system is deployed and begins actual operation. (24:6-7)

The objective of OT&E is to ensure that the system to be produced is actually the system that the user needs. To do this effectively OT&E must be accomplished objectively and impartially. The regulatory guidance fosters

impartiality by specifying that operational testing for each DOD component will be performed by one major field agency, separate and distinct from the materiel developing/ procuring agency and from the using agency, and that the test results and independent evaluation of the system under test will be directly submitted to the Military Service Chief or Defense Agency Director (4:3). The separate agency that is responsible for operational testing in the Air Force is the Air Force Operational Test and Evaluation Center (AFOTEC) located at Kirtland AFB, New Mexico. For major programs AFOTEC manages the test effort and furnishes information to the Air Force Chief of Staff, the Secretary of the Air Force and, in turn, the Office of the Secretary of Defense and the Congress on the results of operational testing. For non-major programs AFOTEC usually serves in an advisory role to the designated operating command that was listed as the responsible test organization in the PMD. AFOTEC reviews and approves the test plan and offers assistance as requested by the major command throughout the testing process (6:8-2). Operational Test and Evaluation decisions are the only decisions not under the purview of the program manager (5:3).

Milestone III/Production and Deployment. The Milestone III decision approval is an actual commitment to production. A contract is negotiated and the Production

phase begins. The Milestone III decision must consider operational testing results as well as cost, schedule, performance and supportability considerations. The results of the operational testing are therefore written to be useful to the program decision makers. If no major problems have been identified during testing, then the final decision will rely primarily on other factors. Testing results have the greatest impact when they report that the system tested is not operationally effective or suitable for meeting the mission need. In such cases, the testing results often become the primary factor in deciding whether the program will proceed into the Production and Deployment phase.

The Deployment phase begins when production items have been provided to the field for operational use and the using command becomes responsible for the equipment. During this transition Program Management Responsibility Transfer (PMRT) takes place. This is when the overall responsibility for managing the program transfers from AFSC to AFLC to include engineering responsibility.

Although it may seem that there is no additional need for testing beyond this point, this definition is not the case.

> OT&E attempts to determine the performance of a system under the most current operational conditions. It is thus a dynamic process, since the operational environment, including the planned missions and uses of a system, is continually changing, as are the

> characteristics of the system itself, and new uses are continually being developed for old systems. OT&E must therefore extend over the entire life cycle of a system, from the initial conceptual stages through system design and deployment to the extension of the life of old systems by adapting them to new ones. (24:2)

This continual process of operational testing is depicted in Figure 1 which shows the different types of test and evaluation and how they relate to the Air Force major system acquisition process. Because non-major programs do not always progress through each of the major system acquisition phases, they are not handled in exactly the same manner. It is therefore beneficial to review the regulatory guidance and associated documentation requirements for non-major programs.

Regulatory Guidance and Non-Major Programs

As was shown earlier, the trend over the past several years has been to make OT&E a much more prominent and integral part of the acquisition decision-making process. DOD Directive 5000.1 formalizes this concept.

> Throughout the acquisition process, emphasis shall be placed upon verifying actual performance through T&E. The procedures of DoD Directive 5000.3 will be integral to all systems acquisition planning and decision-making. (3:7)

For major programs the method for integrating T&E into the decision-making process is to provide OT&E results for consideration in the decisions at each of the major acquisition milestones. This is accomplished in accordance

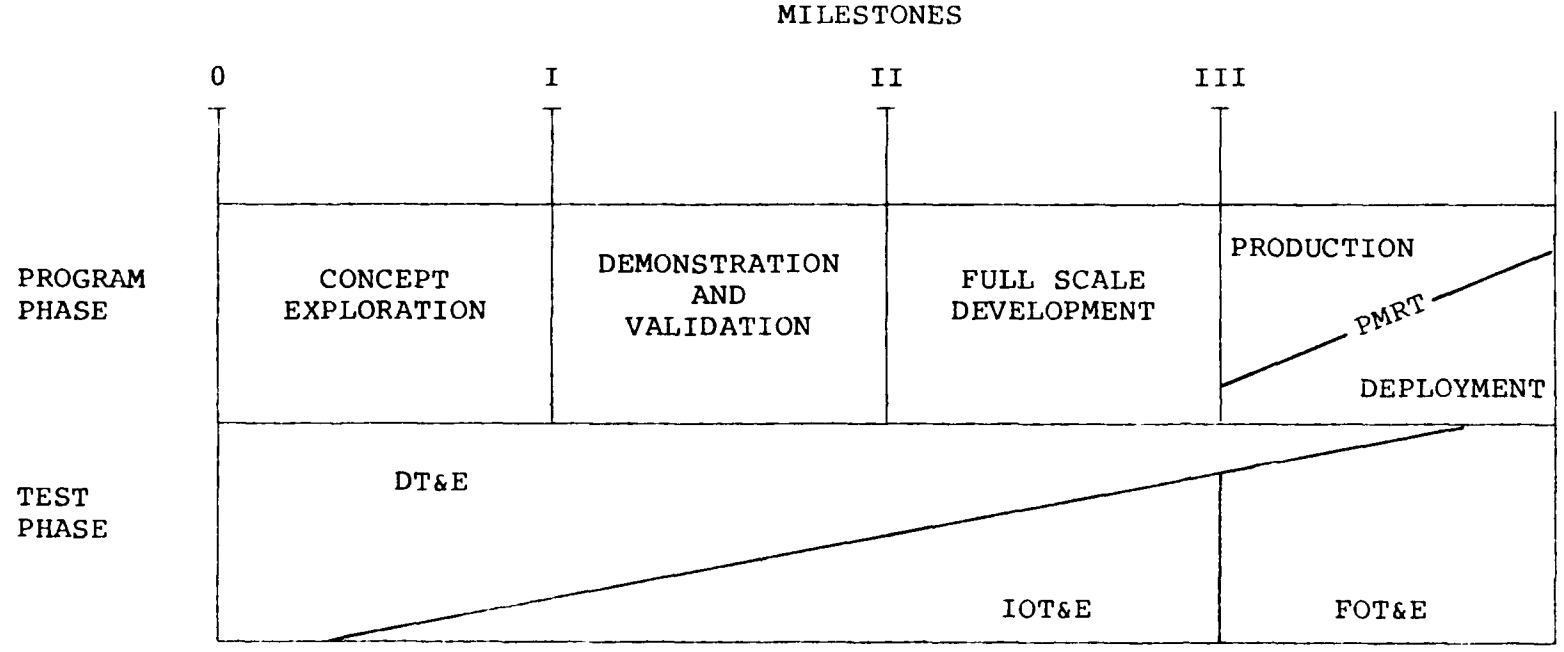

Fig. 1. Air Force Test and Evaluation

with DOD Instruction 5000.2 which describes the primary documentation requirements for each decision point. These documents incorporate all the critical factors in addition to the test results which may impact the determination of whether or not a program is ready to proceed to the next acquisition phase. Non-major programs, however, seldom progress through all of the phases of the acquisition process and are frequently only concerned with the Full-Scale Development and the Production/Deployment phases. Due to the lower review levels the documentation described in DODI 5000.2 is not normally applicable for non-major programs. Yet, the only references to non-major programs in DODD 5000.1 and DODD 5000.3 state that the management principles and objectives described in each directive for major programs shall also apply to programs not designated as major programs. This guidance is not very explicit.

AF Regulation 80-14 offers slightly more guidance. It states that reporting requirements for non-major programs are as specified in the Program Management Directive (PMD), in AF Regulation 55-43, and in AFR 80-14 itself. For non-major programs the procedures to follow depend on whether the program was directly by HQ USAF or initiated by the MAJCOM. Testing directed by HQ USAF is closely monitored by AFOTEC. The OT&E report is sent to the AFOTEC commander who evaluates the comments on the report before sending it to the Chief of Staff of the Air Force. For

testing initiated and conducted by the MAJCOM, the MAJCOM sends copies of the test plan and test report to AFOTEC for entry into the Air Force OT&E data bank (11:11). AFOTEC monitors these programs as well but to a much lesser degree.

It is interesting to note that a study conducted in 1977 on problems concerning test and evaluation policy showed that approximately 82 percent of the programs assigned to AFOTEC were non-major programs. A majority of these were HQ USAF directed, MAJCOM conducted, OT&E programs that require close monitoring by AFOTEC (15:7-8). Close monitoring can include participation in the test planning, approval of the test plan, participation in the test itself, and commenting on the test report. This represents quite a work load to AFOTEC. The contention made by the author of the study was that clear, concise, and accurate policy directives and guidance would allow for significantly less involvement by AFOTEC in the non-major programs and allow more time for the management of major programs (15:8). A review of the applicable regulations suggest that this may still be an area for further improvement.

AFR 80-14 and AFR 55-43 both describe the review levels required for major programs and non-major programs. However, AFR 55-43 is a much more extensive and helpful document for guiding the overall management of operational

test and evaluation conducted by major commands. It describes the documentation requirements for non-major programs in more detail and provides an example of the basic formats for each.

Documents

The first major document that is relevant to test and evaluation is the Program Management Directive (PMD). This document governs the actions and participation of the implementing, using, supporting, and other participating commands in the program. Although preparing the PMD is the responsibility of HQ USAF, the implementing command, AFOTEC, and participating commands are to aid in its preparation. The portion of the PMD that addresses test and evaluation should provide the critical questions, the areas of risk and specific test objectives for the program. It is important that clear test objectives be established from the beginning. The designated test organization should have an input into the establishment of these objectives along with the implementing command to insure that test objectives are realistic.

Frequently, the document used to formalize the test objectives and the scope of the test program is the Test and Evaluation Master Plan (TEMP). This document is required for non-major programs designated by AFSC. The TEMP is an agreement between the program manager and the

test participants on the scope and requirements of the program and the roles of participants (9:6-15). It describes the plan for meeting the test objectives for all test and evaluation to be conducted throughout the acquisition program. The TEMP includes an explanation of how the test will be accomplished, what test resources and funding will be required, and when each testing event will occur for each program milestone. The TEMP is usually a product of the Test Plan Working Group (TPWG). This group is established by the program manager and includes representatives from the program office, the responsible test organization, operating and supporting commands, and AFOTEC (if involved) (13:5).

So far the documents discussed have been primarily concerned with the overall direction of the testing effort. These documents help to guide the preparation of the specific test plans for which the primary test organization is responsible for preparing. The more complete the guidance provided through the PMD and the TEMP, the better the quality of the test plans. For HQ USAF directed, MAJCOM conducted, tests the MAJCOM test organization is responsible for preparing the test plan and sending it to AFOTEC for approval.

It is the general responsibility of the major commands to establish specific procedures required to implement AFR 80-14, AFR 55-43, and associated regulations, and

to establish a command OT&E focal point (8:3-4; 10:10). AFCC has complied with this guidance through an AFCC supplement to add to the general guidance in AFR 80-14, AFCC has not chosen to write its own regulatory guidance on test and evaluation. The supplement designates the HQ AFCC Directorate of Test and Evaluation (AFCC/XOY) as the command office of primary responsibility for all AFCC test and evaluation. The 1815th Test and Evaluation Squadron receives their tasking from this office. For programs initiated by AFCC, the AFCC program manager in conjunction with AFCC/XOY determine whether a TEMP is required (12:1). In all cases, unless USAF direction specifically dictates otherwise, AFCC program managers will establish a TPWG. As discussed previously, this group normally has the responsibility for writing the TEMP. If a TEMP is not required, the TPWG will still perform basically the same function by determining the relevant test objectives and test criteria and setting up a schedule for the required test events.

The guidance for establishing relevant test criteria, however, is not always clear. If the operational and maintenance concepts for a system are not well defined, the guidance provided in the PMD and the TEMP may not be adequate for establishing realistic and relevant test criteria. AFR 55-43 addresses this possible lack of guidance for non-major programs and recommends

that the test organization request clarification of the operational issues, purpose, scope and test objectives from the tasking office (8:6-6). This guidance is required in order to formulate meaningful OT&E objectives and to provide useful results to program decision makers.

The test organization formulates the test criteria from guidance in the PMD, TEMP, the operational and maintenance concepts, and the technical specifications for the system. If insufficient information is provided from these documents, the test planner must seek other sources of information such as previous test plans and personal experience. AFR 55-43 provides some suggestions on how to establish test criteria, but the test planner must still expend considerable effort reviewing all applicable documentation and the stated test objectives to formulate test criteria which is testable and relevant to decision making. The established test criteria are incorporated into the test plan and used to evaluate the system during the operational testing. The validity of the test criteria will directly affect the value of the test results written into the report.

For the most part, AFR 55-43 does a thorough job of providing guidance for the conduct of OT&E. This document has just recently undergone revision to incorporate policy changes and to clarify certain procedures. The 28 June 1985 version supersedes the former publication and

changes it from an AFM to an AFR. A significant change is the introduction of the newly established senior review official, the Director of Operational Test and Evaluation. Additional changes include incorporation of the information from the previous two volumes into one, revision of the formats for OT&E test plans and test reports, and incorporation of the current philosophy on evaluation criteria. The revised publication was written with less experienced OT&E test personnel in mind and presents more detailed procedural guidance and direction (10:61). The regulatory guidance discussed directs the actions of major command test organizations such as the 1815th Test and Evaluation Squadron.

The 1815th Test and Evaluation Squadron

The 1815th Test and Evaluation Squadron located at Wright-Patterson Air Force Base (AFB), Ohio is the primary organization within Air Force Communications Command (AFCC) tasked with Operational Test and Evaluation. It is an independent AFCC unit which reports directly to HQ AFCC.

> Its mission is to accomplish all AFCC led Operational Test and Evaluation in accordance with Air Force Regulation (AFR) 80-14 and Air Force Manual (AFM) 55-43; to manage the worldwide Air Force Technical Evaluation Program (TEP) resources; to operate the AFCC Systems Evaluation School supporting Air Force, Army, Navy, and the Defense Communications Agency (DCA) technical aspects of telecommunications Operational Testing and Evaluation (OT&E); to maintain and operate a technical support facility for use in developing and refining test procedures; and checking the operational condition of evaluation test equipment. (22:1)

The squadron was previously designated the 1815th Test Squadron and was collocated at Scott AFB, Illinois with HQ AFCC. The 1815th was reorganized and relocated to Wright-Patterson AFB on June 1, 1981 in order to provide for additional space requirements. Today the squadron employs slightly over 300 personnel. Over 70 percent of this number are located at Wright-Patterson while the remainder are located at one of the four subordinate units assigned to the squadron. The squadron has submitted a proposal to change its title to the "1815th Test and Evaluation Group" to reflect the primary mission and to denote the size of the organization. This change has not yet been approved but is in line with current Air Force thinking as demonstrated by the recent addition of "operational" to the title of the Air Force Operational Test and Evaluation Center (AFOTEC).

The main unit at Wright-Patterson AFB is organized into three branches: the Operational Test and Evaluation Management Branch, the Follow-on Operational Test and Evaluation Operations Branch, and the AFCC Systems Evaluation School. The Operational Test and Evaluation Management Branch is responsible for performing Qualification OT&E and Initial OT&E. Due to the focus of this paper, it was this branch that furnished much of the information relevant to this research. The branch is organized into two sections. The Traffic Control and Landing Systems

(TRACALS) Operational Test and Evaluation Section performs AFCC led OT&E on Air Force TRACALS and Navigational Aids equipment, while the Communications OT&E Section performs AFCC led OT&E on Air Force communications systems to include: Satellite, High Frequency Radio, Base Communications, AUTOSEVOCOM, and AUTOVON systems (22:1). The operational test and evaluation reports studied in this paper were prepared by these two sections.

Of the slightly over 200 personnel assigned to Wright-Patterson AFB, only thirteen are dedicated to performing IOT&E and QOT&E taskings. The majority of the squadron is assigned to the Follow-on Operational Test and Evaluation Operations Branch. This branch is tasked with performing FOT&E(II). FOT&E(II) is the operational testing of equipment (already fielded) throughout the system's life to determine

> whether the system can meet changing operational requirements, to refine tactics, techniques, doctrine, and training programs for the system, and to identify deficiencies and confirm that they have been corrected. (11:3)

The AFCC Systems Evaluation School conducts courses on evaluation techniques for "selected DOD technicians and engineers who operate, maintain, and evaluate Air Force and DOD communications systems (22:29).

The four subordinate units of the 1815th are detachments that are specifically assigned to perform test and evaluation for large-scale communications systems whose

implementation extends over several years. Detachment 1 is located at Fort Huachuca, Arizona and is tasked with participating in Development Test and Evaluation (DT&E) and Initial Operational Test and Evaluation (IOT&E) for the next generation of tactical communications equipment. The unit is actually under the operational and functional control of the Air Force Operational Test and Evaluation Center (AFOTEC) and represents HQ AFCC and the 1815th Test and Evaluation Squadron in joint service testing. Detachment 2 is located at Vogelweh, Federal Republic of Germany. This detachment supports operational testing requirements for the Digital European Backbone (DEB) program as well as other communication systems in Europe. Detachment 3 is located at Vandenberg AFB, California and participates as an advisor for IOT&E tests of communications systems associated with the Peacekeeper Missile System (M-X Missile). This unit is functionally and operationally responsible to AFOTEC. Detachment 4, located at Yokota AFB, Japan, is responsible for IOT&E testing of communications equipment associated with the Japan Reconfiguration and Digitization (JRD) program (22). IOT&E and QOT&E reports completed by these detachments were also included in this study if they were published within the research time frame.

In addition to the 1815th TES, two other units within AFCC are tasked with testing communications equipment. The 1866th Facility Checking Squadron (FCS) is

responsible for the follow-on test and evaluation of TRACALS equipment. It is also an independent unit reporting directly to AFCC. The 1954th Radar Evaluation Squadron (RADES) at Hill AFB, Utah is a subordinate unit of the Engineering Installation Division of AFCC. It is responsible for all operational testing of heavy radar equipment. Although these two units are occasionally tasked to conduct or participate in DT&E and OT&E of new systems, they actually only accomplish technical evaluations of performance. Evaluations in the areas of training, safety, reliability, maintainability, and the other suitability factors accomplished in a full OT&E effort are not normally performed (16:12). Therefore, test reports prepared by these units were not considered in this research. The next chapter will discuss the methodology used to conduct this research.

III. Methodology

The method employed to obtain answers to the research questions includes reviewing pertinent regulations and selected OT&E reports, and conducting structured interviews of test personnel and program managers. This method is deemed appropriate because of the nature of the information required to answer the research questions.

Regulations and documents applicable to Air Force test and evaluation identify the intended purpose for OT&E and the specific procedures to be followed when performing OT&E. These sources provide the background necessary to understand test and evaluation and provide a basis upon which to formulate relevant interview questions.

Test reports are reviewed to obtain the final results of the test and the recommendations relevant to the production decision. Based on this review and the review of the applicable regulations and documents a set of questions can be developed for conducting interviews. Interviews are conducted with the appropriate test directors and program managers to determine their perceptions of the test results as it is believed that the testers and the decision makers that produce and/or receive copies of the test reports are the ones that could most

accurately assess their value. The testers develop the test plan, actually perform the testing, and write up the final test report. The program managers are responsible for the overall management of a particular program and receive a copy of the test report for use in the decision-making process as intended by regulation. Through interviews of test personnel and program managers associated with specific test reports, a more complete understanding of the usefulness of test results in making the first major production decision can be obtained.

Review of Regulations and Selected Test Reports

The regulations and documents that are most applicable to Air Force test and evaluation include DOD Directive 5000.3, Test and Evaluation; AF Regulation 80-14, Test and Evaluation; AF Regulation 55-43, Management of Operational Test and Evaluation; and AFOTEC Regulation 55-1, AFOTEC Operations Regulation. These documents can be reviewed to determine the intended purpose of Air Force test and evaluation, the procedures and guidelines for conducting OT&E, and the required contents of OT&E reports. This information is used in the review of selected test reports and in the formulation of interview questions.

A census of IOT&E and QOT&E test reports from the last four years are used for the purpose of this research effort. Over the past four years an average of

approximately three IOT&E/QOT&E test reports have been written each year in AFCC. This was not considered a large enough population to facilitate taking a representative random sample. Because of these small numbers all IOT&E and QOT&E test reports from the last four years were reviewed for the purpose of noting specific recommendations made on each. The time frame of four years was chosen because the 1815th TES, which is the responsible organization for performing AFCC operational tests and evaluations, has only been in being in its current configuration for a little over four years. IOT&E and QOT&E test reports from previous years will not be taken because of the procedural changes associated with the formation of the new organization. The test results from the last four years are believed to be more representative of the current organizational structure and the current regulatory guidance. This approach offers more validity to the research results so that they can be generalized across the total population of IOT&E and QOT&E conducted by AFCC.

Selection of Personnel to be Interviewed

The selection of test personnel and program managers to be interviewed is based on the specific communication system that was tested. Test personnel that have participated in the testing of the system are chosen because they are most able to recall the testing procedures and

any problems encountered during the testing. It is likely that problems or limitations encountered while testing may have detracted from the usefulness of the test results. Therefore, it is important to understand what these problems are when considering test results and the usefulness of the test report in the decision-making process.

Program managers maintain complete records of actions taken during the acquisition process. Because these records document major decisions, they can normally reveal when the major production decision was made and the factors considered in the decision. This information is helpful in determining the usefulness of the OT&E test report to the production decision.

Because of the nature of military life, an obvious limitation to this selection methodology is the fact that several of the original program managers and test directors may no longer be assigned to the same organization, especially for older programs. Where possible the original participants are interviewed. If the original program manager is no longer assigned to the program and can not be reached, then the current program manager of the program can be interviewed. Due to the extensive records maintained on each program it is believed that the current program manager is capable of answering the interview questions satisfactorily. If the original test director is no longer assigned to the test squadron and

can not be reached, then a test team participant that is still assigned to the squadron can be interviewed.

Development of Interview Questions

Interview questions are structured to answer the two major research questions presented in Chapter I and were intentionally made open-ended to avoid restriction of the answers of the respondents. Because of the different perspectives and areas of expertise that the testers and program managers possess, the interview questions are not the same for both. Testers are asked questions that are more specific to the testing process and which primarily address the research question concerning the sufficiency of test and evaluation reports. Program managers are asked questions that are more specific to the acquisition decision-making process and which primarily address the research question dealing with the usefulness of test reports in making production decisions. There are also interview questions asked of testers and program managers that seek to answer both research questions and not just the one associated with their specific areas of expertise. The interview questions that are asked of testers and program managers are listed in Table I and Table II respectively.

TABLE I

INTERVIEW QUESTIONS ASKED OF TESTERS

1. What was the composition and qualification of the test team?

2. At what phase of the program did AFOTEC/1815th get involved (Concept Exploration, Demonstration and Validation, etc.)?

3. What kind of communication did the test director have with the program manager?

4. Did the operational test team and the program manager agree on operational objectives for testing? Please explain.

5. Were the priorities similar for the test team and the program manager?

6. Were there any limitations or constraints placed on the test team? If so, what were they?

7. Were these limitations or constraints valid?

8. Did these limitations or constraints adversely affect the value of the test report? In what way?

9. How were the criteria used for operational testing obtained/determined? What guidance was the test team provided?

10. Were there any deficiencies in the test report itself? If so, what were they?

11. Were significant results uncovered in testing which were not included in the test report? If so, what were they and why were they left out?

12. What could have been done to improve the testing effort?

TABLE II

INTERVIEW QUESTIONS ASKED OF PROGRAM MANAGERS

1. What is the dollar value of this program?

2. How many years has this program been in being and how many more is it projected for?

3. Was this program directed by HQ USAF or initiated by the major command?

4. What was the date of the production decision?

5. What is the current status of the program?

6. Did you review the OT&E results such as the test reports, service reports, and status reports? If so, were these reports complete and timely?

7. Did the results of these reports impact the production decision for the program? In what way?

8. Were there any unusual problems or limiting factors during the operational test that may have impacted the value of the test reports? If so, what were they?

9. Did you feel that the personnel performing the operational testing were well trained and qualified to do the testing? What were the indications that they were/were not?

10. Was there anything left out of the operational test report that you would have liked to have seen included? Please explain.

11. Do you have any recommendations on how to improve the OT&E performed by the 1815th?

12. What were the factors that impacted the production decision for this program? Which had the most impact?

13. Was the production decision made prior to the completion of the OT&E? If so, what was the reason for this?

Conducting Interviews

Interviews are conducted in person whenever possible. If personal interviews are not feasible, telephone interviews can be conducted. Personal interviews are preferred because they allow the greatest transfer of information, especially if the test reports and program files are readily available for review and discussion, but this may not be possible in many cases. The interview questions listed in Tables I and II serve as the basis for discussion. These questions were pretested by conducting preliminary interviews with the 1815th TES to determine their adequacy in obtaining the information required to answer the research questions. In addition to the interview questions, a listing of the specific recommendations made in individual test reports are used to guide questions on how these recommendations are used.

Interview results are reviewed to determine any common trends or specific problem areas and to provide the basis for conclusions. A complete discussion of the findings is presented in the next chapter. Recommendations formulated from the results are stated in the final chapter of this thesis.

IV. Findings

Examination of the test reports written by the 1815th OT&E Management Branch over the past four years revealed that most of the tests conducted were QOT&E. Fourteen test reports were reviewed altogther. Of these, ten were classified as QOT&E, three as IOT&E, and one was a special evaluation that could not be classified as either an IOT&E or a QOT&E. The special evaluation was conducted to assess the ability of two existing systems to interface with each other and did not incorporate many of the operational effectiveness and operational suitability considerations normally evaluated in an OT&E. Therefore, this evaluation is not included as part of the results in this chapter. Two of the test reports designated as IOT&E were actually tests conducted on improvements to existing Air Force systems. They were not classified as QOT&E efforts because of the expenditure of research and development funds.

As noted earlier, new systems requiring an extensive research and development effort are quite often priced in the DOD Major or the AF Designated Acquisition Program category. The responsibility for conducting operational testing for these programs is generally assigned to AFOTEC.

Programs normally considered non-major are those that either evaluate off-the-shelf equipment for military use or seek to improve existing equipment in the Air Force inventory by modifying it. These are the types of systems that the major commands are usually directed to test because they seldom cost as much as new systems which undergo extensive research and development efforts. Table III shows the dollar values of the programs that were studied. The majority of the programs were valued under $25 million. The one program costing $1 billion involves the procurement of an off-the-shelf system that is being installed Air Force-wide to replace existing systems which no longer provide the capability required. All of the programs studied were non-major programs directed by HQ USAF. A review of the regulatory guidance and associated documentation concerning non-major programs was made and presented in Chapter II. This information provided insight into the management of non-major programs and aided in the design of the interview questions asked of test directors and program managers.

Interview Results

A list of the interviews conducted for this research is provided in the appendix. Thirteen program managers and eleven test directors or team members were interviewed. One of the program managers was responsible

TABLE III

DOLLAR VALUES OF PROGRAMS STUDIED

Dollar Value	Number of Programs
Less than $10 Million	4
$10 Million to $25 Million	6
$25 Million to $50 Million	0
$50 Million to $100 Million	2
$1 Billion	1

for managing two of the programs studied and two of the test directors were responsible for two separate tests each. The test director for one program could not be reached for an interview and no other team members with knowledge of the OT&E could be found. Since the special evaluation was not a true OT&E effort, the responses of the test director and the program manager for this program have not been included in the following results.

The results of the structured interviews provided the basis for determining the answers to the two major research questions presented in Chapter I. The first research question was:

> Are the evaluation reports sufficient in terms of practical recommendations to provide valid input into the production decisions?

In terms of the interview questions, the ones that most apply to this question are those dealing with the

test report itself, the qualifications of the test team, the determination of the test criteria, and the limitations of the test. Although the interview questions that address the test report directly are most valid, the other considerations are also valid in that they help to determine the quality of the test report. The qualifications of the test team can affect the quality of the test report in two ways, through the test plan and the test itself. If the test team is well qualified it will be able to construct an objective and valid test plan for evaluation of the system. An important part of test planning is the determination of evaluation criteria. These criteria establish levels against which a system's performance is compared in order to judge the achievement of required operational effectiveness or suitability characteristics. To be valid the criteria must be directly related to user requirements. The value of the test report can be affected if the test team does not represent typical operators and maintainers. The qualifications and skill levels of the test team must be representative of those expected to maintain and operate the system to ensure that the test environment is as realistic as possible. Limitations of the test environment determine which test objectives can and can not be addressed in the test. It is important to know what these are when evaluating a system.

The questions dealing directly with the program manager's perception of the test reports provided the results listed in Table IV. All but one of the program managers interviewed felt that the test reports were complete and provided the necessary information they required for program decisions. In the one case that the test report was not considered sufficient, the program manager believed that the evaluation criteria were inadequate for some of the test objectives. Several of the objectives had incomplete evaluation criteria or no criteria at all, which made some of the test results inconclusive. The overall test report was seen to be of value, however, and was the primary factor used in the decision to buy the system.

TABLE IV

PROGRAM MANAGER'S PERCEPTION OF THE TEST REPORT

Questions	Response	
	Yes	No
Is the report complete?	12	1
Is the report timely?	8	5

The issue of evaluation criteria, although it was an area of concern to only one of the program managers interviewed, was an area of significant concern to the test directors. From the discussion of evaluation criteria

presented earlier in the paper, it was apparent that there is no standard methodology for determining evaluation criteria. This is a function of the differences in the systems tested and the extent of the guidance provided in the programming documents. In determining the relevant evaluation criteria, the testers usually review all applicable program documents, regulatory guidance, and technical specifications first. If satisfactory evaluation criteria can not be established from these documents, further guidance is requested from the program office. When questioned about the evaluation criteria, the test directors interviewed revealed that the programming documentation did not provide adequate guidance for the establishment of specific evaluation criteria for six of the thirteen programs studied and that further guidance had to be requested from the program office. In at least three of the cases the evaluation criteria was the result of brainstorming sessions among the TPWG participants. For each test program the criteria were eventually agreed upon by the program manager and the test participants prior to testing.

As shown in Table IV, the primary complaint from program managers concerning the test reports was the delay in receiving them after completion of testing. Table V shows the time lapses experienced for the programs studied. The turnaround time for distribution of the test

TABLE V

TIME BETWEEN TEST COMPLETION AND PUBLICATION OF TEST REPORT

Length of Time	Number of Programs
Less than 1 month	2
1 to 2 months	4
2 to 3 months	3
3 to 4 months	1
4 to 5 months	0
5 months or greater	3

reports for all the programs reviewed ranged from two weeks to five months. A majority of the test reports were distributed in less than three months after test completion. Although program managers expressed dismay at the delay in test report distribution for five out of the thirteen programs, it is interesting to note that for all but two of the programs the program manager was in continual contact with the test director throughout the testing period and received weekly status reports of the progress and test results. It appears as if the test reports may actually be more of a formality for providing test results than the sole source of system performance.

When questioned on whether they felt the test team was well qualified to perform the testing, the program managers were unanimous in their response. They all felt

that the team was well trained and qualified to perform the testing. In questioning the test directors on the composition of the team and qualifications of the team members, it was evident that the teams were carefully chosen. Operations and maintenance personnel whose training and skill levels were representative of those to be assigned to the system tested were chosen for the OT&E effort. This greatly contributed to the realism of the testing and, perhaps, to the perception of the validity of the reported results.

With regard to the realism of the test, the area of most concern was that of limitations placed on the test environment. Since the test articles were normally production items, the system configuration was as close to the actual as possible. Several of the tests were performed in a laboratory environment but this did not seem to adversely affect the test results. Although the test environment was not as realistic as it would have been in a true operational setting, extra effort was expended to simulate the operational environments. Laboratory tests were generally conducted to test the interface capability between several pieces of equipment prior to placing this equipment in the field environment. For those tests performed in an operational setting, only those scenarios deemed most representative of the operating environment

were tested. It was not possible to exhaustively test all possible scenarios but this was seen as a valid constraint.

The most common limitation was the length of time allowed for testing. Table VI shows the test durations for the programs studied. Test periods ranged from two weeks to 180 days. The tests that lasted only two to three weeks were normally testing a relatively simple technology or were restricted because of mission requirements that would not allow further testing on the operational system. The test duration was seen as a limiting factor by the test director primarily because it often did not allow sufficient time to collect significant data on the reliability and maintainability of the system. It was difficult to determine whether the system failures experienced during the test period would be representative of the system under continual operation because of such a small sample size. For the most part, however, time limitations were seen as valid by the testers when considering the tradeoff between costs and the marginal utility of longer test periods.

Another factor related to this was the logistics and supply support which was often provided by the contractor of the system during the test. This supply support was not necessarily representative of the support the system would receive under normal operating conditions. Any such limitations experienced during the test were noted in the test report.

TABLE VI

TEST DURATION

Length of Test	Number of Programs
Less than 30 days	5
30 to 60 days	0
60 to 90 days	4
90 to 120 days	1
120 to 150 days	1
150 to 180 days	0
180 days or more	2

The other limitations experienced during testing which impacted the perception of the validity of the report were related to the readiness of the system to be operationally tested. In some cases the technical data was incomplete and the system software was not adequately tested during the developmental phase prior to the start of operational testing. These limitations impacted the test results but not the value of the test report. The test report served its purpose by providing an accurate evaluation of the current system configuration for use by the program decision makers. The overall results indicate that test reports are perceived to be sufficient to provide valid inputs into the program decision-making process.

The second major research question that this study addressed was:

> If the test results are deemed sufficient, are they being used effectively by program decision makers?

As noted above, program managers view the test reports as being valuable to the decision-making process. To determine how they are used in the decision-making process, the answers to the interview questions that apply to this research question were examined. The questions that most apply are the ones concerning the timing of the production decision, the impact of the test results, the factors that impacted the production decision, and the phase the test organization became involved with the program. The timing of the production decision can show whether or not the OT&E results were used primarily because decisions made prior to the start of testing could not have possibly included the test results in the decision process. The impact of test results deal directly with how the test results were used. The factors that impacted the production decision other than testing can help provide an understanding of the dynamics involved in the decision-making process. The phase the test organization became involved in the program may be able to reveal whether or not early involvement makes a difference in the use of test results in the decision-making process.

One of the programs studied did not involve the acquisition of equipment. Its purpose was to assess available technology for future application. For this reason it will not be included in the results for the second research question. For six out of the twelve programs involving the acquisition of equipment, the production decision was made before the testing began. Because the systems tested were not dealing with totally new and untried technology, the probability that the systems would not meet the mission need was deemed small and the risk acceptable. The OT&E test results had no impact on the production decisions in these cases. The OT&E was used primarily to identify deficiencies and to ensure that the system would operate satisfactorily under actual field conditions. Although the operational testing had no impact on these production decisions, the results could have possibly led to the termination of the procurement if in fact a system was proven incapable of meeting the mission need. None of these programs was cancelled due to operational test results.

Although the focus of this research was primarily concerned with the usefulness of test results in the production decision, this was not the only area in which the test reports proved useful for the programs studied as noted above. In fact, the operational test results were considered the primary factor in making production

decisions for just three of the programs studied that made the production decision after the OT&E was completed. Two of these programs tested several competing off-the-shelf systems and reported the results of each system for comparative analysis. This analysis aided decision makers in determining which system would best meet the stated need. The other program tested just one off-the-shelf system to determine whether or not it had the required capability to satisfy the need. Table VII reflects the factors, as reported by the program managers, that had the most impact on production decisions.

TABLE VII

FACTORS HAVING THE MOST IMPACT ON THE PRODUCTION DECISION

List of Factors	Number of Programs
Mission Need (Downward Directed)	6
Performance Specifications (DT&E)	2
OT&E Results	3
Availability of Funds and Hardware	1

Four out of the six programs in which the mission need was listed as the factor having the most impact on the production decision made the production decision prior to the start of testing. For the two programs listing performance specifications as the primary factor the

results were split. While the three of these programs which made the production decision after test completion did not list OT&E as the primary decision factor, the OT&E results were nonetheless a significant factor in the decision.

One system was already in the field before operational testing was requested. The primary factors in the production decision were the availability of hardware that appeared to meet the need and the availability of funding for immediate use from another program. The result of this production decision was a fielded system that lacked adequately trained personnel and logistics support. Earlier operational testing is likely to have prevented many of the problems that have plagued this program.

Involvement in the acquisition process ideally starts as early as possible. The point in the acquisition process that the test organization became involved varied for each program. For six of the programs the 1815th TES became involved during the Full-Scale Development phase. For one program involvement began during the Demonstration and Validation phase. For the remaining five programs involvement began during the Concept Exploration phase.

It is interesting to note that the programs involving the 1815th as early as the Concept Exploration phase fell into one of two categories: modification and improvement programs or high cost programs. The main

reason that modification and improvement programs involve the test organization early is that quite often it is the test organization that initially identifies the need to modify or improve the system. Three programs were in this category. The remaining two were high cost programs. One was the $1 billion program mentioned earlier and the other was a program that is valued around $60 million. For these programs the test organization may have been involved earlier in the acquisition process primarily due to higher visibility. The phase of involvement in the acquisition process was not a good indicator of whether or not the OT&E results would be used in the production decision. The production decision was made prior to the testing for both of the high cost programs and one of the modification programs. The other two modification programs made the production decision after the test results but listed the operational need and DT&E results as the primary factors in the decision.

To summarize, the findings on this research question revealed that test results were being used effectively by the program decision makers, but not specifically as a prime consideration in the production decisions. OT&E results had the most impact on the production decision when evaluating off-the-shelf equipment in a competitive test to see which of several systems would best meet the need. For non-major programs which involved essentially

known technology, OT&E results were not deemed as critical to the production decision as they were to ensuring the system was operationally ready for deployment in the field. The next chapter will discuss the major conclusions reached from these findings and offer some possible recommendations.

V. Conclusions and Recommendations

From the review of the literature it is apparent that testing accomplished at the major command level is very different from the testing performed by AFOTEC. This is due to the nature of the systems each are tasked to evaluate. AFOTEC normally tests major new acquisition systems that involve a significant expenditure of research and development funds, while the major command OT&E organizations normally test non-major system modifications or off-the-shelf technology to be adapted for military use. The guidance provided for major programs is much more detailed and structured than that provided for non-major programs. The primary test and evaluation regulations offer very little guidance for non-major systems.

Initial and/or qualification operational testing is most often performed prior to the production decision at the major command level when there are several systems that are to be evaluated competitively. In these cases the findings indicate that the operational test results are a major factor in the decision to proceed with production. In other cases, because the systems tested at the major command level deal with essentially known technology with known capabilities, there is not as strong an

emphasis on operational testing prior to the production decision.

Even though operational test results are not always a primary consideration in production decisions, they are still necessary to the decision-making process. Test results reveal to decision makers the status, capabilities, and limitations of the system and its readiness to be fielded. When test results identify deficiencies they indicate areas that need correction before the system will meet the stated need at the required performance levels. Actions taken to correct these deficiencies help to insure that the systems eventually fielded are operationally effective and operationally suitable.

The findings indicate that the operational test reports are sufficient and useful for providing valid input into the decision-making process. The results may not always have a major impact on whether a system is procured or not, but they tend to insure that the system fielded performs as it was intended.

Recommendations

The findings of this research indicated several areas in which OT&E might be improved. From reviewing the regulatory guidance, there appears to be a lack of definitive guidance on the purpose and conduct of OT&E for non-major programs. The major test and evaluation

regulations offer very little guidance. Although AFR 55-43 offers some guidance for conducting OT&E for non-major programs, it needs to be expanded at the major command level. The current guidance provided by AFCC is not complete and is somewhat confusing. The AFCC supplement to AFR 80-14 should be expanded or a separate AFCC regulation written to provide clear and explicit guidance for OT&E conducted by AFCC.

Earlier involvement by the OT&E command with the developing command is recommended. In a few of the programs studied the 1815th TES did not become involved until just prior to deployment of the system. Better communication between AFSC and AFCC could have allowed earlier involvement. This may have led to earlier testing in the acquisition process and the scheduling of longer test periods for more thorough testing of reliability and maintainability specifications. AFCC and AFSC should try to insure that the responsible test organization is brought into a program as early as possible.

Another area that can be improved concerns the readiness of systems to be tested. Logistics support requirements and development testing which is the responsibility of the contractor or the developing command should be completed before the OT&E test team starts its tests. Better planning at the program management level could

preclude premature operational testing of systems that are not ready to be tested.

Areas for Further Research

In the course of this research there were several areas discovered that would benefit from further research. One of the areas is the deficiency reporting and tracking system used by program managers in AFSC. A common complaint was that deficiencies are not followed up in a timely and efficient manner. Research in this area would be directed toward evaluating the present management information system and comparing it with alternative methods of deficiency tracking. Other research in this area could examine the effectiveness of using a tracking system which links AFSC to the test organizations which identify the deficiencies and to the supporting command which will have responsibility for the deployed system.

Another area that could benefit from further research is the evaluation of the effectiveness of simulation techniques in OT&E. The expense of conducting operational tests can often be prohibitive, especially in the testing of major weapon systems by AFOTEC. Other tests, primarily concerned with survivability, are impractical. A research report written by Lt Col Greg Mann entitled The Role of Simulation in Operational Test and Evaluation would be a good starting point for such research (20).

An additional area for research would be the extension of the research in this thesis to the other major commands, such as Strategic Air Command (SAC) and Tactical Air Command (TAC), to determine if OT&E conducted by these commands has similar characteristics and limitations as those discovered here.

Appendix: List of Interviews

Baughn, Maj Lawrence E., Jr. Program manager for the Jam Resistant Secure Communications Terminal. Telephone interview. Electronics Systems Division (AFSC), Hanscom AFB MA, 25 July 1985.

Beltran, Lt Roger. Program manager for the VORTAC Class IV B Modification (AN/FRN-43). Telephone interview. Sacramento Air Logistics Center (AFLC), McClellan AFB CA, 23 July 1985.

Biram, Capt Cliff M. Program manager for the Automated Audio Remote Test System and the Digital Access and Cross Connect System. Telephone interviews. HQ Air Force Communications Command, Scott AFB IL, 23 July and 5 August 1985.

Boal, Maj Robert H. III. Program monitor for the Ground Launched Cruise Missile Convoy/Security Radios. Telephone interview. HQ USAF, Washington DC, 30 July 1985.

Bradshaw, TSgt Gerald W. Test director for the Initial Operational Test and Evaluation of the AN/GPN-22 (V) Precision Approach Radar ECCM Improvement. Personal interview. 1815th Test and Evaluation Squadron (AFCC), Wright-Patterson AFB OH, 31 August 1985.

Gallant, CMSgt John I. Program manager for the AN/TPN-19 Communications Improvement Program. Telephone interview. Electronic Systems Division (AFSC), Hanscom AFB MA, 6 August 1985.

Grant, SMSgt Griffin M. Test director for the Qualification Operational Test and Evaluation of Scope Dial. Telephone interview. 2046th Communications Group (AFCC), Wright-Patterson AFB OH, 2 August 1985.

Green, Lt Donald E., Jr. Program manager for the AN/GPN-22 (V) Precision Approach Radar ECCM Improvement. Telephone interview. Electronic Systems Division (AFSC), Hanscom AFB MA, 24 July 1985.

Harvie, Lt Richard C. Test director for the Initial Operational Capability Combined Test Activity Evaluation of the Jam Resistant Secure Communications Terminal. Personal interview. 1815th Test and Evaluation Squadron (AFCC), Wright-Patterson AFB OH, 31 July 1985.

Heard, John. Assistant program manager for Scope Signal III. Telephone interview. Engineering Installation Division (AFCC), Tinker AFB OH, 2 and 5 August 1985.

Hughes, TSgt Richard C. Associate test director for the Qualification Operational Test and Evaluation of the Automated Audio Remote Test System. Personal interview. 1815th Test and Evaluation Squadron (AFCC), Wright-Patterson AFB OH, 2 August 1985.

Jessen, Lt Karlin B. Program manager for the Transmission Monitoring and Control System. Telephone interview. Electronic Systems Division (AFSC), Hanscom AFB MA, 1 August 1985.

Johns, CMSgt Larry L. Test director for the Qualification Operational Test and Evaluation of the VORTAC Class IV B Modification (AN/FRN-43). Personal interview. 1815th Test and Evaluation Squadron AFCC), Wright-Patterson AFB OH, 31 July 1985.

Loftin, Gene. Associate test director for the Special Evaluation of the Aeronautical Systems Division Tie Line Network. Telephone interview. Aeronautical Systems Division (AFSC), Wright-Patterson AFB OH, 2 August 1985.

Martin, Maj Miles O. Project manager for Scope Dial. Telephone interview. HQ Air Force Communications Command, Scott AFB IL, 30 July 1985.

McDonald, Ann M. Program manager for the Fixed Record Communication Teletypewriter. Telephone interview. Sacramento Air Logistics Center (AFLC), McClellan AFB CA, 24 July 1985.

Musard, MSgt Henry A. Test director for the Qualification Operational Test and Evaluations of Scope Signal III and the Digital Access and Cross Connect System. Personal interview. 1815th Test and Evaluation Squadron (AFCC), Wright-Patterson AFB OH, 1 August 1985.

Petryk, MSgt Charles W. Test director for the Qualification Operational Test and Evaluation of the Ground Radio Interface Device (HYX-58). Personal interview. 1815th Test and Evaluation Squadron (AFCC), Wright-Patterson AFB OH, 31 July 1985.

Poncherri, Dick. Dayton Defense Metropolitan Area Telephone System manager. Telephone interview. Aeronautical Systems Division (AFSC), Wright-Patterson AFB OH, 2 August 1985.

Qualters, MSgt John W. Test director for the Initial Operational Test and Evaluation of the AN/TPN-19 Communications Improvement Program. Personal interview. 1815th Test and Evaluation Squadron (AFCC), Wright-Patterson AFB OH, 1 August 1985.

Roberts, Capt Charles E. Test director for the Qualification Operational Test and Evaluation of the Transmission Monitoring and Control System and associate test director for the Qualification Operational Test and Evaluation of the Ground Launched Cruise Missile Convoy/Security Radios. Personal interview. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, 1 August 1985.

Rodriguez, Feliciano. Program manager for the Ground Radio Interface Device. Telephone interview. HQ Air Force Cryptologic Support Center (ESC), San Antonio TX, 1 August 1985.

Schriml, Capt John M. Supervisor of test directors that conducted the Qualification Test and Evaluation of the Fixed Record Communication Teletypewriter. Telephone interview. HQ Air Force Communications Command, Scott AFB IL, 2 August 1985.

Schwieterman, Louis. Program manager for the Chemical Warfare Defense Ensemble Gloves. Telephone interview. Aeronautical Systems Division (AFSC), Wright-Patterson AFB OH, 30 July 1985.

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The use of operational test and evaluation (OT&E) results in the acquisition decision-making process has been increasingly emphasized in the past years and has gained even more prominence with the establishment of the Operational Test and Evaluation Office at the Department of Defense. Special emphasis has been placed on the use of OT&E in the production decision. Initial Operational Test and Evaluation (IOT&E) and Qualification Operational Test and Evaluation (QOT&E) are the types of test and evaluation that are normally conducted on systems prior to the first major production decision in the acquisition process. While IOT&E usually evaluates new systems and QOT&E usually evaluates off-the-shelf systems, they both provide program decision makers with valid estimates of operational effectiveness and operational suitability upon which they can base their decisions. This ~~research~~ has looked at how IOT&E and QOT&E reports written by the 1815th Test and Evaluation Squadron (AFCC) are used in the acquisition of non-major communication systems. The results of this research reveal that the OT&E conducted by the 1815th is usually QOT&E performed on off-the-shelf systems. Since these systems involve very little technical risk the OT&E results are not usually the primary factor in production decisions. OT&E results are most useful in pointing out deficiencies requiring correction prior to fielding such systems.

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